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Sasami

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(54) **IMAGE FORMING APPARATUS, IMAGE PRINTING METHOD, AND COMPUTER-READABLE RECORDING MEDIUM HAVING STORED THEREIN IMAGE PRINTING CONTROL PROGRAM**

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H04N 1/393 (2006.01)

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CPC ***H04N 1/40*** (2013.01); ***G03G 15/652*** (2013.01); ***H04N 1/3935*** (2013.01); *G03G 15/6564* (2013.01)

(58) **Field of Classification Search**
CPC G03G 15/20–15/2096; G03G 15/652; H04N 1/3935; H04N 1/40
See application file for complete search history.

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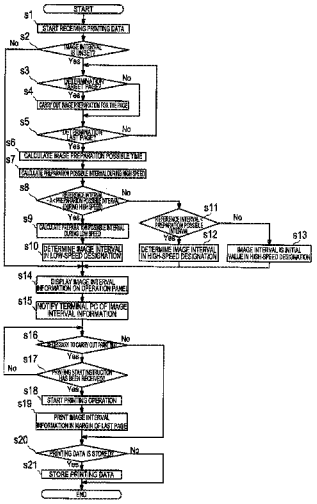
(57) **ABSTRACT**

An image forming apparatus includes an image forming section that performs processing for forming an image on continuous paper on the basis of image data and a control section that performs image preparation for converting printing data into image data from which an image can be formed and controls the image forming section to execute printing of a plurality of images at equal intervals on the continuous paper. The control section performs, before the image formation processing, according to image sizes in a paper passing direction, image forming speeds, and image preparation times related to the images, printing condition setting for setting an interval of the images.

34 Claims, 11 Drawing Sheets



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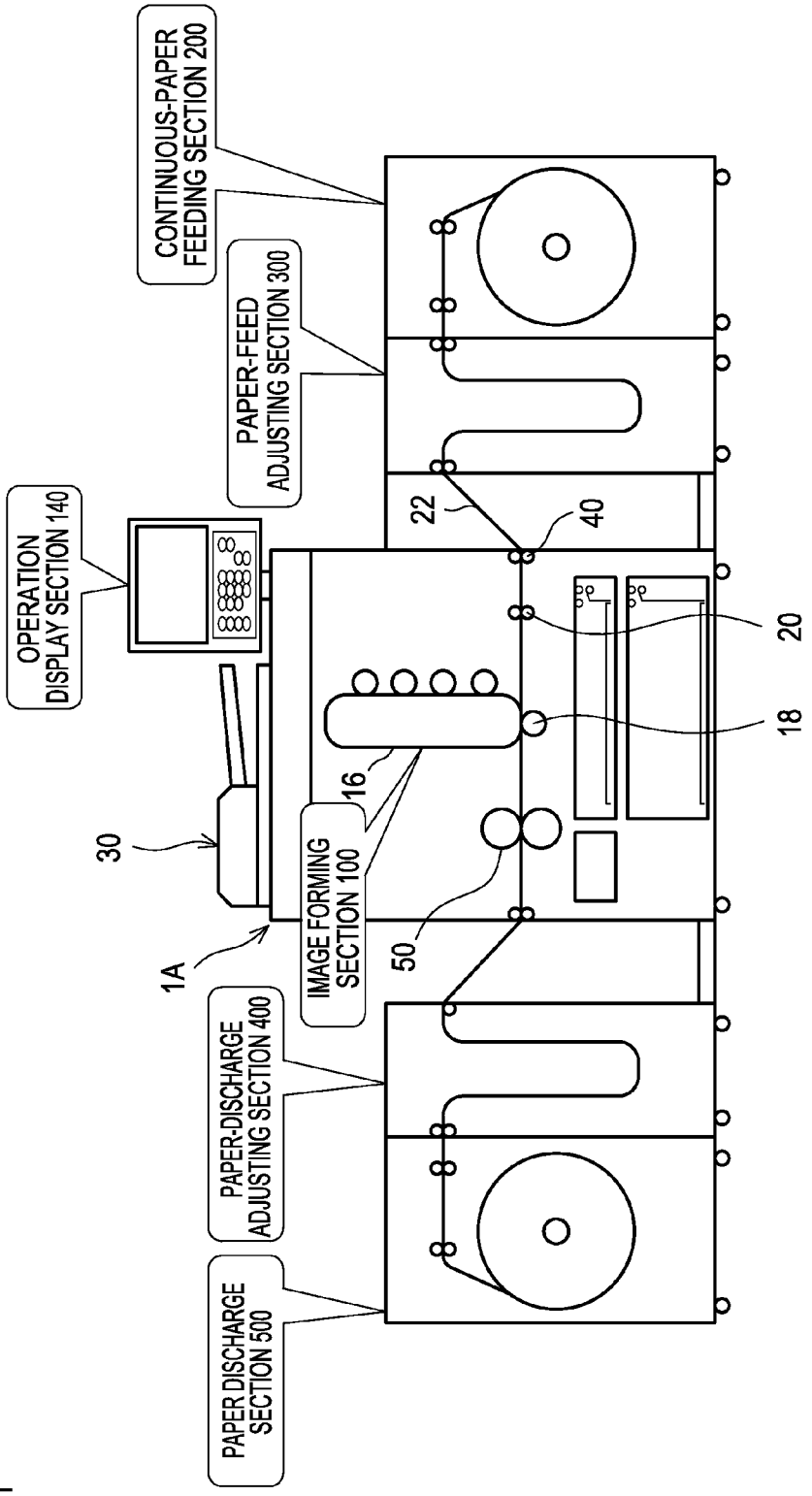

CONTINUOUS-PAPER FEEDING SECTION 200
PAPER-FEED ADJUSTING SECTION 300
OPERATION DISPLAY SECTION 140
IMAGE FORMING SECTION 100
PAPER-DISCHARGE ADJUSTING SECTION 400
PAPER DISCHARGE SECTION 500
1A
30
16
50
22
40
20
18
1

FIG.1

FIG.2

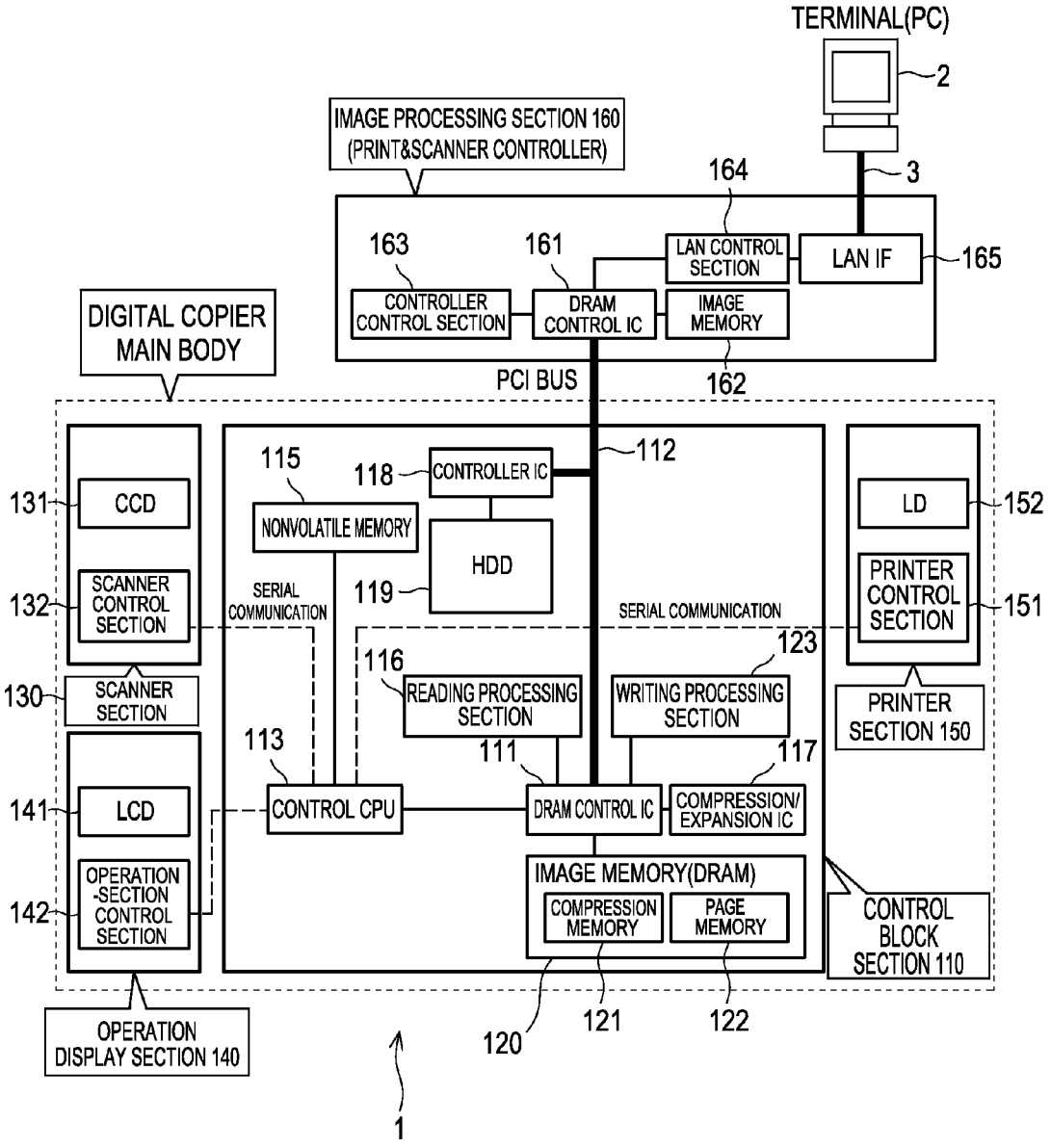

TERMINAL(PC)
2
3
IMAGE PROCESSING SECTION 160
(PRINT&SCANNER CONTROLLER)
164
163
161
LAN CONTROL SECTION
LAN IF
165
CONTROLLER CONTROL SECTION
DRAM CONTROL IC
IMAGE MEMORY
162
DIGITAL COPIER MAIN BODY
PCI BUS
112
115
118
CONTROLLER IC
131
CCD
NONVOLATILE MEMORY
HDD
LD
152
132
SCANNER CONTROL SECTION
SERIAL COMMUNICATION
119
SERIAL COMMUNICATION
PRINTER CONTROL SECTION
151
123
116
130
SCANNER SECTION
READING PROCESSING SECTION
WRITING PROCESSING SECTION
PRINTER SECTION 150
113
111
117
141
LCD
CONTROL CPU
DRAM CONTROL IC
COMPRESSION/ EXPANSION IC
IMAGE MEMORY(DRAM)
142
OPERATION -SECTION CONTROL SECTION
COMPRESSION MEMORY
PAGE MEMORY
CONTROL BLOCK SECTION 110
OPERATION DISPLAY SECTION 140
120
121
122
1

FIG.3

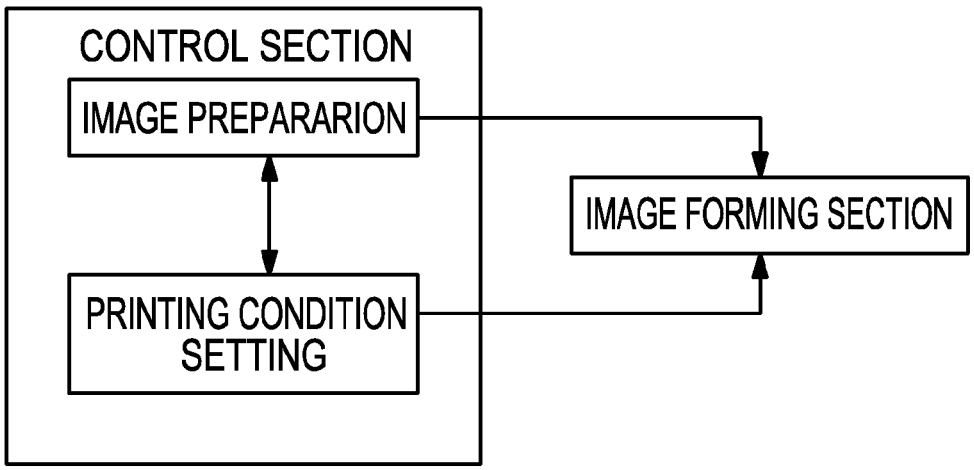

CONTROL SECTION
IMAGE PREPARARION
PRINTING CONDITION SETTING
IMAGE FORMING SECTION

FIG.4

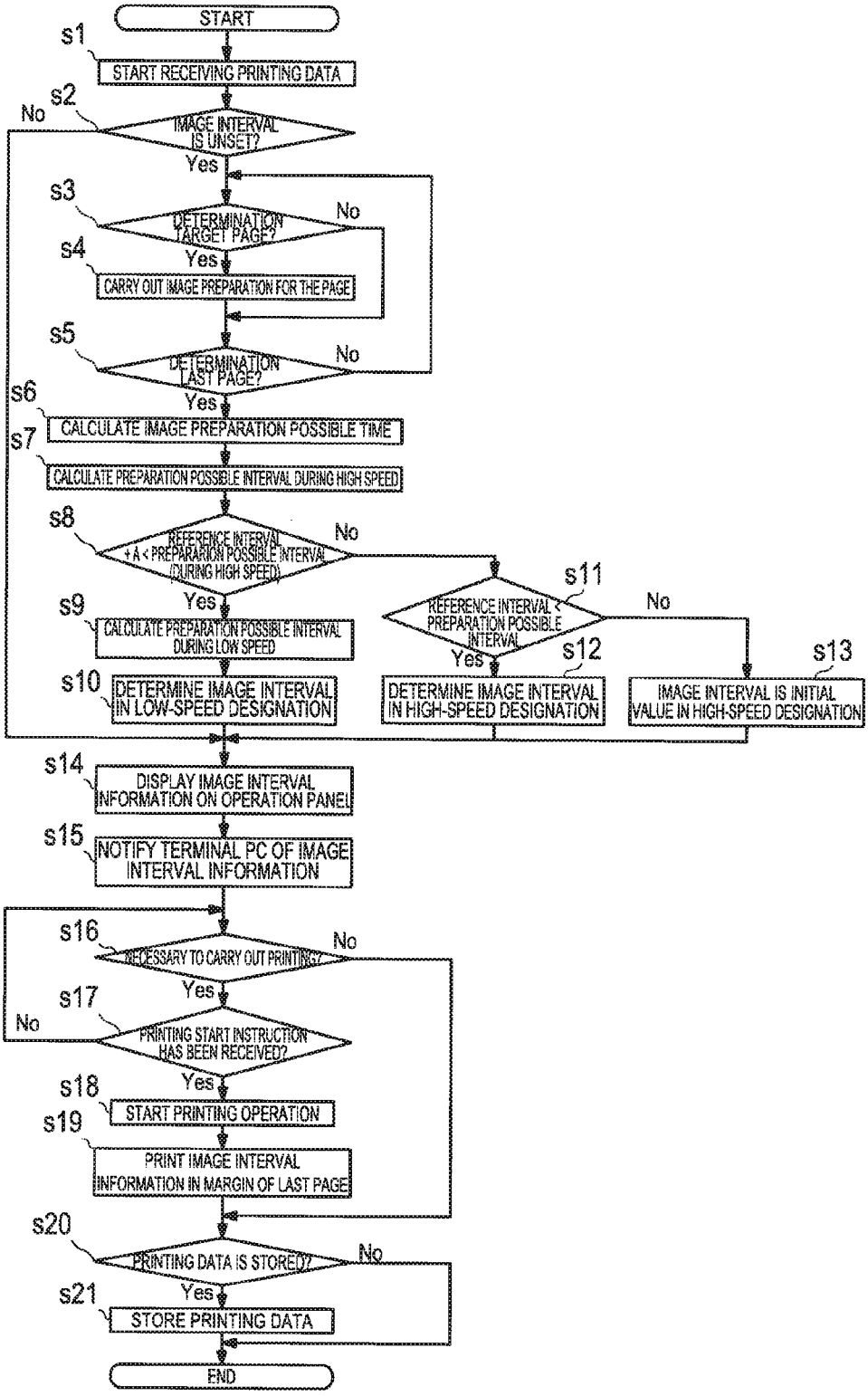

START
s1
START RECEIVING PRINTING DATA
s2
IMAGE INTERVAL IS UNSET?
No
Yes
s3
DETERMINATION TARGET PAGE?
No
Yes
s4
CARRY OUT IMAGE PREPARATION FOR THE PAGE
s5
DETERMINATION LAST PAGE?
No
Yes
s6
CALCULATE IMAGE PREPARATION POSSIBLE TIME
s7
CALCULATE PREPARATION POSSIBLE INTERVAL DURING HIGH SPEED
s8
REFERENCE INTERVAL + A < PREPARARION POSSIBLE INTERVAL (DURING HIGH SPEED)
No
Yes
s9
CALCULATE PREPARATION POSSIBLE INTERVAL DURING LOW SPEED
s10
DETERMINE IMAGE INTERVAL IN LOW-SPEED DESIGNATION
s11
REFERENCE INTERVAL ? PREPARATION POSSIBLE INTERVAL
No
Yes
s12
DETERMINE IMAGE INTERVAL IN HIGH-SPEED DESIGNATION
s13
IMAGE INTERVAL IS INITIAL VALUE IN HIGH-SPEED DESIGNATION
s14
DISPLAY IMAGE INTERVAL INFORMATION ON OPERATION PANEL
s15
NOTIFY TERMINAL PC OF IMAGE INTERVAL INFORMATION
s16
NECESSARY TO CARRY OUT PRINTING?
No
Yes
s17
PRINTING START INSTRUCTION HAS BEEN RECEIVED?
No
Yes
s18
START PRINTING OPERATION
s19
PRINT IMAGE INTERVAL INFORMATION IN MARGIN OF LAST PAGE
s20
PRINTING DATA IS STORED?
No
Yes
s21
STORE PRINTING DATA
END

FIG.5

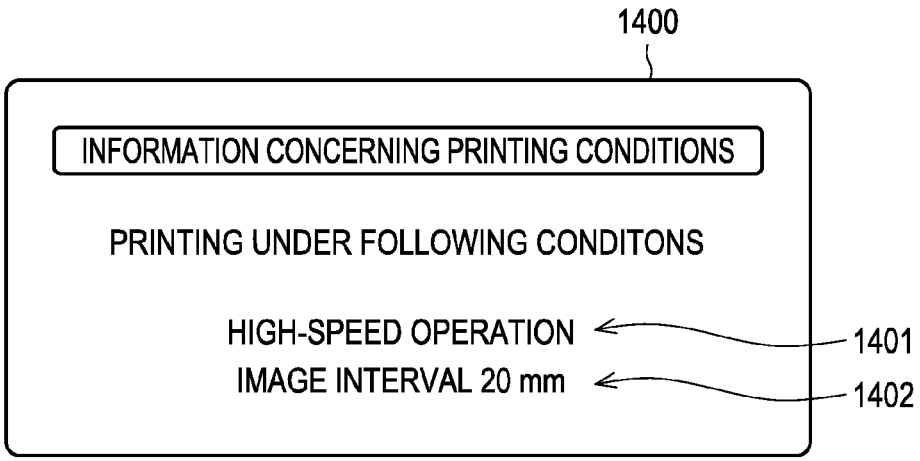
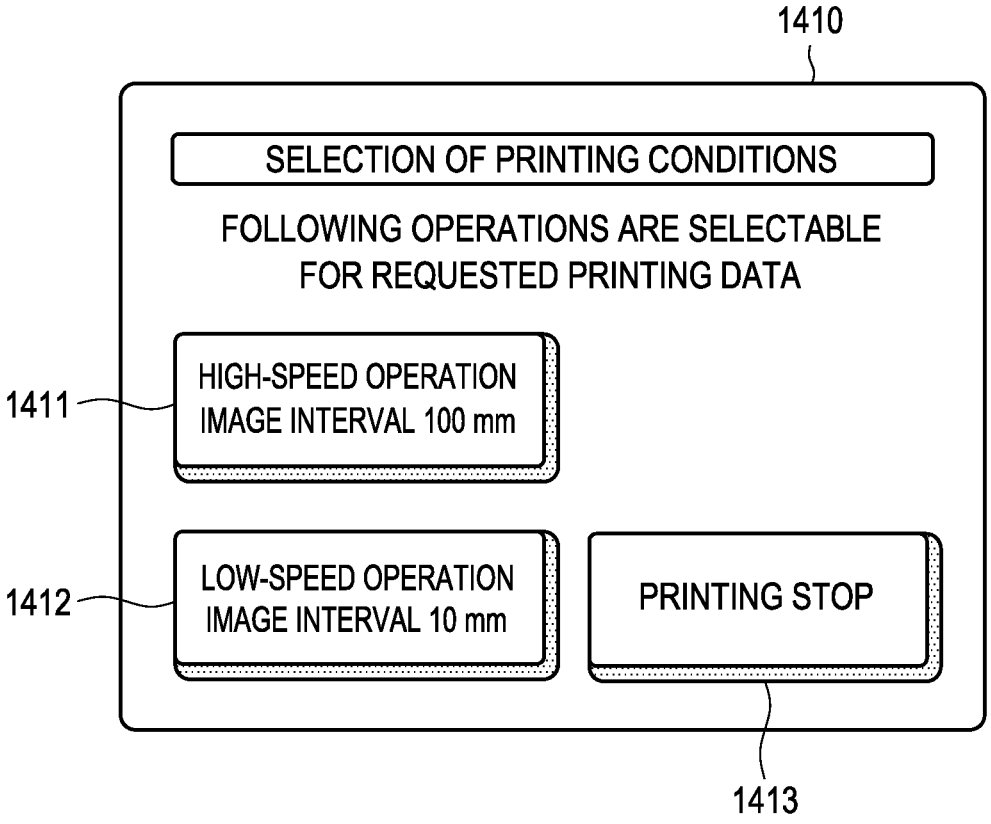

1400
INFORMATION CONCERNING PRINTING CONDITIONS
PRINTING UNDER FOLLOWING CONDITONS
HIGH-SPEED OPERATION
1401
IMAGE INTERVAL 20 mm
1402

FIG.6


1410
SELECTION OF PRINTING CONDITIONS
FOLLOWING OPERATIONS ARE SELECTABLE FOR REQUESTED PRINTING DATA
1411
HIGH-SPEED OPERATION IMAGE INTERVAL 100 mm
1412
LOW-SPEED OPERATION IMAGE INTERVAL 10 mm
PRINTING STOP
1413

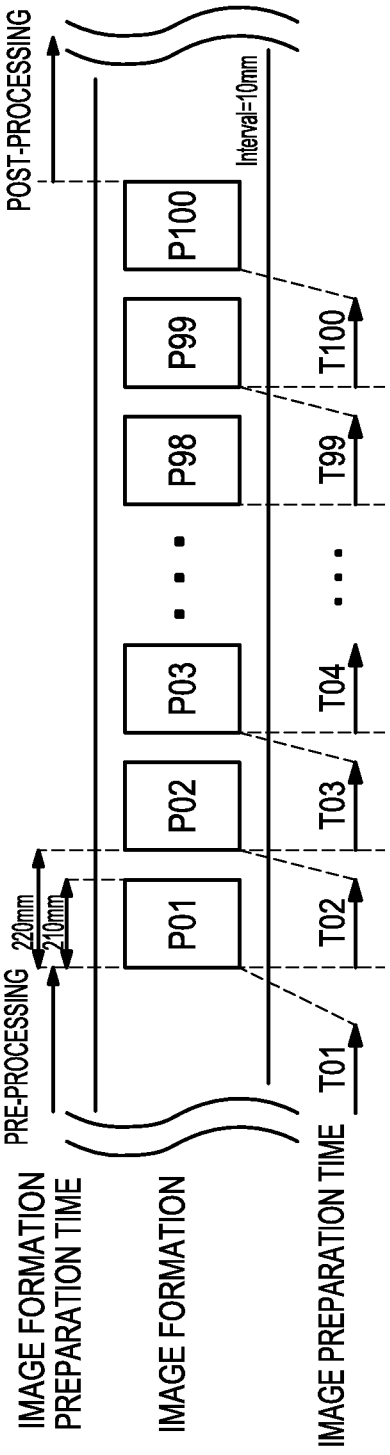

POST-PROCESSING
Interval=10mm
P100
P99
P98
P03
P02
P01
T100
T99
T04
T03
T02
T01
220mm
210mm
PRE-PROCESSING
IMAGE FORMATION PREPARATION TIME
IMAGE FORMATION
IMAGE PREPARATION TIME

FIG.7

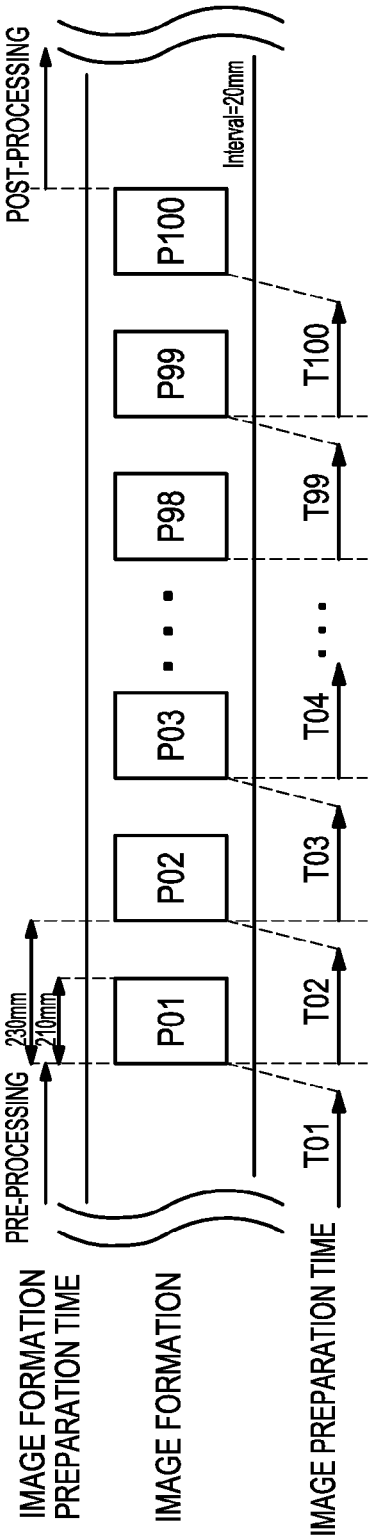

POST-PROCESSING
Interval=20mm
P100
P99
P98
P03
P02
P01
T100
T99
T04
T03
T02
T01
230mm
210mm
PRE-PROCESSING
IMAGE FORMATION PREPARATION TIME
IMAGE FORMATION
IMAGE PREPARATION TIME

FIG.8

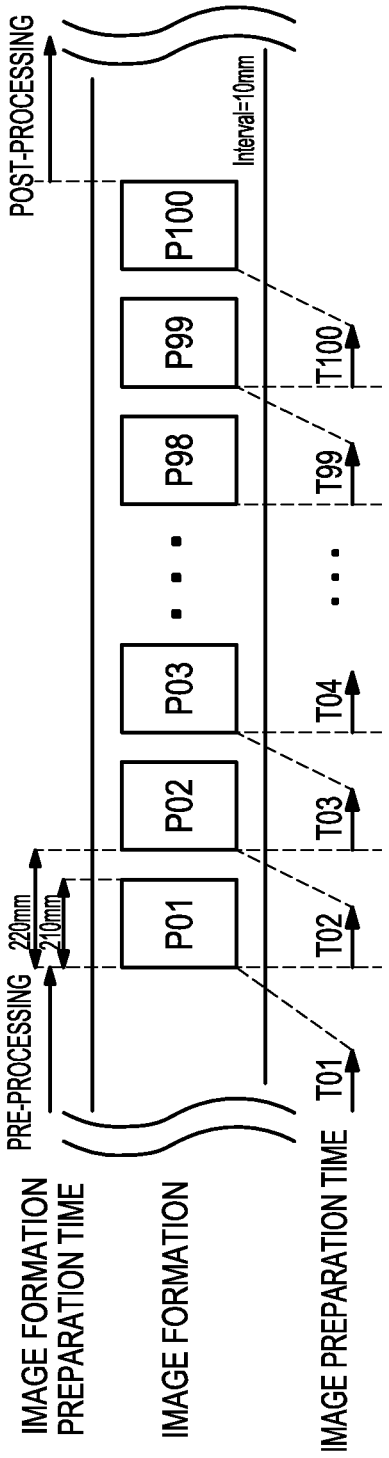

POST-PROCESSING
Interval=10mm
P100
P99
P98
P03
P02
P01
T100
T99
T04
T03
T02
T01
220mm
210mm
PRE-PROCESSING
IMAGE FORMATION PREPARATION TIME
IMAGE FORMATION
IMAGE PREPARATION TIME

FIG.9

FIG.10

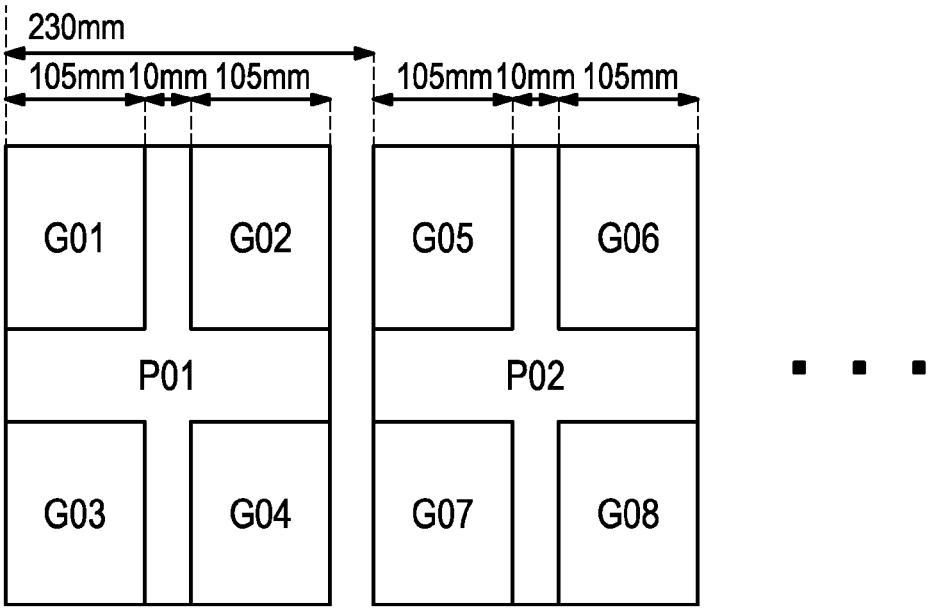

230mm
105mm
10mm
105mm
105mm
10mm
105mm
G01
G02
G05
G06
P01
P02
G03
G04
G07
G08

FIG.11

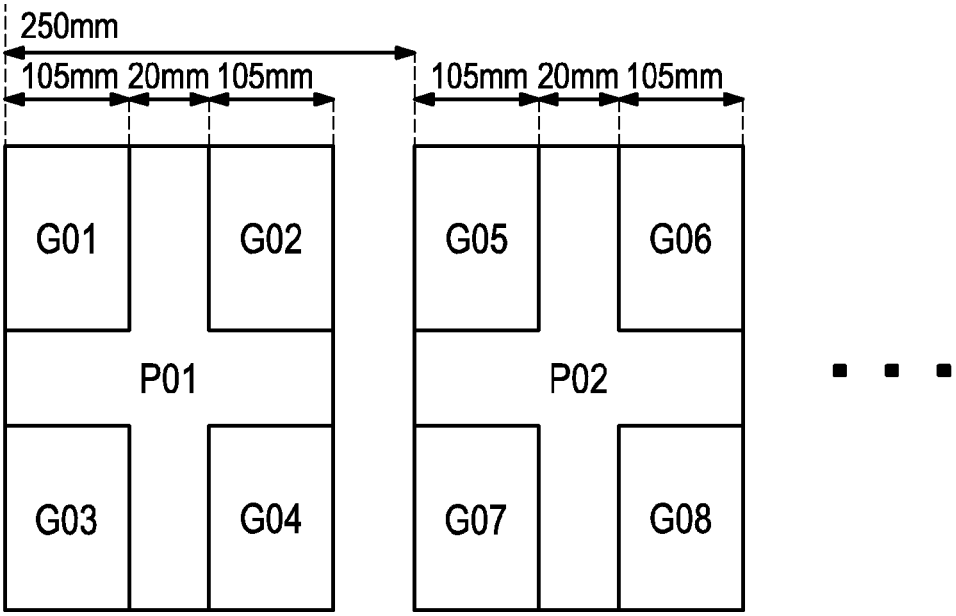

250mm
105mm 20mm 105mm
105mm 20mm 105mm
G01
G02
G05
G06
P01
P02
G03
G04
G07
G08

IMAGE FORMING APPARATUS, IMAGE PRINTING METHOD, AND COMPUTER-READABLE RECORDING MEDIUM HAVING STORED THEREIN IMAGE PRINTING CONTROL PROGRAM

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims priority under 35 U.S.C. §119 to Japanese Patent Application No. 2014-127543, filed Jun. 20, 2014. The contents of this application are incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an image forming apparatus, an image printing method, and a computer-readable recording medium having stored therein an image printing control program for printing images on continuous paper at fixed intervals.

2. Description of the Related Art

In an image forming apparatus that prints images on continuous paper, it is desirable to set an interval between the images, that is, a blank region as small as possible because the interval becomes a break. However, high resolution of printing jobs has been further enhanced. The image interval set small is late for printing timing for forming the next image.

As measures against this problem, Japanese Patent Application Laid-Open No. 2008-15609 (Cited Reference 1) proposes a continuous-paper printing apparatus that determines whether generation of image data is in time for printing timing based on the image data and, when determining that the generation of the image data is late, dynamically inserts a predetermined number of skip pages among printing pages based on the generated image data to continue a printing operation without stopping the printing operation halfway in printing.

However, in the technique proposed in Cited Reference 1, it is possible to prevent the printing operation from being stopped halfway in the printing. However, since blank pages are inserted, regions to be breaks increase. It is conceivable to change the size of the image interval according to necessity. However, when processing is performed in a post-processing apparatus after the printing ends, in some case, die cutting, cutting, labeling, or the like is performed without performing precise alignment assuming that a printed image interval is fixed. If intervals among images are irregular, proper post-processing cannot be performed.

In the case of an analog printing machine, since the analog printing machine is configured to repeatedly print an image, a plate of which is manufactured, at a fixed cycle. Therefore, if image forming speed is fixed, it is easy to guarantee that images are formed at equal intervals. On the other hand, in the case of a digital printing machine, an image is written after image data is prepared in a unit of a page. Time required for the preparation fluctuates according to complexity of RIP (raster image processor) processing of the image data, presence or absence of page numbering, and the like. Therefore, even if an image size is always fixed, it is difficult to guarantee image arrangement at equal intervals on continuous paper. The image preparation time also depends on a processing ability of an image forming apparatus. Therefore, the image preparation time cannot be accurately calculated unless printing data is actually converted into image data from which an image can be formed. The demand of the image interval for the printing on the continuous paper cannot be satisfied.

If a delay of 1 millisecond occurs at linear velocity of 300 mm/second, the image interval delays by 1*300/1000=0.3 mm. This is unallowable variation in the field of commercial printing.

At least one object of the present invention is to provide an image forming apparatus, an image printing method, and a computer-readable recording medium having stored therein an image printing control program that can set an unnecessary blank region as small as possible such that image preparation processing is in time for image formation and can surely perform post-processing by arranging images at equal intervals and printing the images.

SUMMARY OF THE INVENTION

To achieve at least one of the abovementioned objects, an image forming apparatus reflecting one aspect of the present invention comprises: an image forming section that performs processing for forming an image on continuous paper on the basis of image data; and a control section that performs image preparation for converting printing data into image data from which an image can be formed and controls the image forming section to execute printing of a plurality of images at equal intervals on the continuous paper. The control section performs, before the image formation processing, according to image sizes in a paper passing direction, image forming speeds, and image preparation times related to the images, printing condition setting for setting an interval of the images.

In the abovementioned display device, it is preferable that, in the printing condition setting, the control section can performs setting of the interval of the images and setting of the image forming speed.

In the abovementioned display device, it is preferable that, in the printing condition setting, when image formation at image forming speed set in advance is late for image formation at a predetermined image interval, the control section sets the image interval within the predetermined image interval and sets the image forming speed lower than the image forming speed set in advance.

In the abovementioned display device, it is preferable that, in the printing condition setting, the control section calculates image preparation times with respect to all images of the printing data and calculates an image interval on the basis of a maximum of the image preparation times.

In the abovementioned display device, it is preferable that, in the printing condition setting, the control section calculates image preparation times with respect to images from a first image to a predetermined number of the printing data and calculates an image interval on the basis of a maximum of the image preparation times.

In the abovementioned display device, it is preferable that, in the printing condition setting, the control section calculates image preparation times of image data having a characteristic presumed to take time for image preparation and calculates an image interval on the basis of a maximum of the image preparation times.

In the abovementioned display device, it is preferable that, in the printing condition setting, in a case of printing data configured by repetition of a same image or an image obtained by processing a part of the same image, the control section calculates the image interval on the basis of an image preparation time of first one image.

In the abovementioned display device, it is preferable that, in the printing condition setting, in a case of printing data configured by a plurality of prints, the control section calculates the image interval on the basis of printing data of a first print.

In the abovementioned display device, it is preferable that, after receiving an execution instruction for a printing operation, the control section calculates the image interval in the printing condition setting.

In the abovementioned display device, it is preferable that the control section stores, in association with the printing data, printing conditions set in the printing condition setting and does not perform recalculation of the printing conditions when same printing data is reprinted.

In the abovementioned display device, it is preferable that, when a notification request for printing conditions is sent from a printing data creating apparatus outside the image forming apparatus to the image forming apparatus, after receiving the printing data, the control section performs the printing condition setting and notifies the printing data creating apparatus of the obtained printing conditions.

In the abovementioned display device, it is preferable that, when layout processing for the image data is set in a job, the control section performs image formation on the basis of image data for which a layout position is determined on the basis of the set image interval.

In the abovementioned display device, it is preferable that the control section notifies a user of the set printing conditions.

In the abovementioned display device, it is preferable that the control section notifies the user of the printing conditions after printing.

In the abovementioned display device, it is preferable that the control section notifies the user of the printing conditions set before a printing start to enable the user to select the printing conditions or instruct to stop printing.

In the abovementioned display device, it is preferable that the control section controls the image forming section to print, in a margin portion of continuous paper, setting information set under the printing conditions.

In the abovementioned display device, it is preferable that in the printing condition setting, the control section calculates the image preparation time while causing control affecting a conversion processing time of the image data to operate same as an actual image forming operation.

To achieve at least one of the abovementioned objects, an image printing method reflecting one aspect of the present invention comprises a first form of the present invention includes: an image preparing step for performing image preparation for converting printing data into image data from which an image can be formed; a printing condition setting step for setting, before the image formation, an interval of images according to image sizes in a paper passing direction, image forming speeds, and image preparation time related to the images; and an image forming step for arranging, on the basis of the image data, a plurality of images at equal intervals on continuous paper according to the printing conditions and forming an image.

To achieve at least one of the abovementioned objects, a computer-readable recording medium, reflecting one aspect of the present invention, having stored therein an image printing control program executed by a control section that controls an image forming apparatus that performs processing for forming an image on continuous paper on the basis of image data,

the image formation control program executing in the control section comprises:

an image preparing step for performing image preparation for converting printing data into image data from which an image can be formed;

a printing condition setting step for setting, before the image formation, an interval of images according to image sizes in paper passing directions, image forming speeds, and image preparation times related to the images; and

an image forming step for arranging, on the basis of the image data, a plurality of images at equal intervals on continuous paper according to the printing conditions and forming an image.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic diagram showing an image forming apparatus in an embodiment of the present invention;

FIG. **2** is a diagram showing control blocks of the image forming apparatus and an image forming system in the embodiment;

FIG. **3** is a diagram showing control blocks showing a relation between a control section and an image forming section in the embodiment;

FIG. **4** is a flowchart for explaining a procedure for setting an image interval on the basis of image preparation times and performing a printing operation in the embodiment;

FIG. **5** is a diagram showing a notification screen for set printing conditions in the embodiment;

FIG. **6** is a diagram showing an operation screen for the set printing conditions in the embodiment;

FIG. **7** is a diagram showing an image interval in an example in the embodiment;

FIG. **8** is a diagram showing an image interval in another example in the embodiment;

FIG. **9** is a diagram showing an image interval in still another example in the embodiment;

FIG. **10** is a diagram showing an image interval in a layout in still another example in the embodiment; and

FIG. **11** is a diagram showing an image interval in a layout in still another example in the embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the present invention is explained below with reference to the drawings.

FIG. **1** shows an image forming apparatus in the embodiment of the present invention.

An image forming apparatus **1** includes an apparatus main body **1**A. A paper-feed adjusting section **300** is connected to a front stage side of the apparatus main body **1**A. A continuous-paper feeding section **200** is connected to a front stage side of the paper-feed adjusting section **300**. A paper-discharge adjusting section **400** is connected to a paper discharge side of the apparatus main body **1**A. A paper discharge section **500** is connected to a paper discharge side of the paper-discharge adjusting section **400**.

Note that the image forming apparatus can also be configured by only the apparatus main body **1**A and is not limited to the configuration of this embodiment.

In this embodiment, a post-processing apparatus that performs appropriate post-processing such as laminating and cutting can be connected to the image forming apparatus **1**. The post-processing apparatus can be provided in the image forming apparatus. The post-processing apparatus can be connected to the apparatus main body to configure the

image forming apparatus. The post-processing apparatus can be connected to the image forming apparatus to configure an image forming system.

The continuous-paper feeding section **200** has a function of housing and storing roll paper and feeding the paper to the apparatus main body **1**A. The roll paper is equivalent to roll paper of the present invention. The paper discharge section **500** has a function of holding the roll paper discharged from the apparatus main body **1**A.

The paper-feed adjusting section **300** has a buffer function for absorbing a very small speed difference and deviation between the continuous-paper feeding section **200** and the apparatus main body **1**A. The paper-discharge adjusting section **400** has a buffer function for absorbing a very small speed difference and deviation between the paper discharge section **500** and a printer.

Note that, in this embodiment, the roll paper is used as continuous paper. However, the continuous paper is not limited to the roll paper and only has to be continuing papers. The continuous paper can be provided in a form of the roll paper or for example, the continuous paper can be fed from an alternately folded form.

The image forming apparatus **1** includes, in the apparatus main body **1**A, an image forming section **100** that forms an image on a paper. The image forming apparatus **1** includes, in an upper part of the apparatus main body **1**A, an operation display section **140** that receives operation by an operator and displays information. In the operation display section **140**, an operation section for performing operation and a display section for performing display can be separately configured. Like a touch panel LCD, the operation section and the display section can be integrally configured. The operation display section **140** can receive a printing action and a setting change and perform display of various kinds of information.

The image forming apparatus **1** includes, on the apparatus main body **1**A, an automatic document feeding device that automatically reads a document and a document reading section **30** capable of performing image reading through platen glass. An image of the document is read by the document reading section **30** and once recorded in a not-shown image memory or the like. The read image is used for formation of an image by the image forming section **100**.

The image forming section **100** includes photosensitive bodies respectively prepared for colors (cyan, magenta, yellow, black, etc.). Not-shown charging devices, writing sections, and developing units are disposed in peripheral line portions of the photosensitive bodies. The surfaces of the photosensitive bodies charged by the charging devices are subjected to image exposure by the writing sections such as LDs on the basis of image information of the document recorded in the image memory or the like. Latent images are formed on the surfaces of the photosensitive bodies. The latent images are developed by the developing units to be toner images. The toner images are transferred onto an intermediate transfer belt **16**. An image on the intermediate transfer belt **16** is carried by a conveying path **22** and transferred onto a conveyed paper while being compression-bonded by a secondary transfer roller **18**. The image forming section **100** performs image formation by an electrophotographic process and transfers the image onto the paper.

In the image forming section **100**, not-shown cleaning sections that come into contact with the photosensitive bodies and remove residual toner are disposed further on a rotating direction side than contact positions with the intermediate transfer belt **16** and further on a rotating direction opposite side than the charging devices to correspond to the photosensitive bodies. A not-shown another cleaning section that removes the residual toner of the intermediate transfer belt **16** is disposed further on the rotating direction side than a paper transfer position of the intermediate transfer belt **16** and further on the rotating direction opposite side than a transfer position from the photosensitive bodies.

Note that the photosensitive bodies are driven to rotate by a not-shown driving motor. The intermediate transfer belt **16** is also driven to rotate by a not-shown driving motor.

The image forming apparatus **1** includes the conveying path **22** that leads from the continuous-paper feeding section **200** to the paper-feed adjusting section **300** and the image forming section **100** and leads from the image forming section **100** to the paper-discharge adjusting section **400** and the paper discharge section **500**.

The conveying path **22** feeds and conveys the paper and configures a part of a paper conveying section. In the conveying path **22**, the roll paper housed in the continuous-paper feeding section **200** is fed and the roll paper is conveyed to the image forming section **100** through a conveying roller **40** and a registration roller **20**.

The paper having the image transferred thereon is compression-bonded by a fixing section **50** and applied with heat and pressure while being conveyed, whereby the toner image on the paper is fixed. The paper is discharged to the outside of the apparatus main body **1**A.

In the image forming apparatus **1**, the roll paper conveyed by the conveying path **22** reaches the paper-discharge adjusting section **400**. A very small speed difference and deviation of the roll paper are absorbed by a buffer mechanism.

The continuous paper passed through the paper-discharge adjusting section **400** reaches the paper discharge section **500** through the conveying path **22**. The continuous paper is wound around a roll and held.

FIG. **2** is a block diagram showing the electric configurations of the image forming apparatus and the image forming system of the present invention. The electric configurations are explained below.

The image forming apparatus **1** includes, as main components, a copier main body including a control block section **110**, a scanner section **130**, the operation display section **140**, and a printer section **150** and an image processing section (a print & scanner controller) **160** that processes image data input to and output from an external apparatus (e.g., a terminal (a PC) **2** through a LAN. The image processing section **160** configures an image-data creating device in the present invention.

The control block section **110** includes a PCI bus **112**. The PCI bus **112** is connected to a DRAM control IC **111** in the control block section **110**. The control block section **110** includes a control CPU **113**. The DRAM control IC **111** is connected to the control CPU **113**. A nonvolatile memory **115** is connected to the control CPU **113**. In the nonvolatile memory **115**, an image formation control program and other programs for causing the control CPU **113** to operate, setting data of the image forming apparatus **1**, setting data of a deviation correction adjustment amount due to paper characteristics of the paper such as process control parameters, and the like are stored.

The control CPU **113** controls the entire image forming apparatus **1** and grasps a state of the entire image forming apparatus. The control CPU **113** performs image formation control, calculation of image preparation times, setting of an image interval, and the like. That is, the control CPU **113** functions as a part of the control section of the present invention.

The image formation control program of the present invention is stored in the nonvolatile memory **115** in advance. Besides, the image formation control program can be introduced by a removable nonvolatile memory.

The scanner section **130** includes a CCD **131** that performs optical reading and a scanner control section **132** that performs control of the entire scanner section **130**. The scanner control section **132** is serially communicably connected to the control CPU **113** and receives control by the control CPU **113**. Note that the scanner control section **132** can be configured by a CPU, a program for causing the CPU to operate, and the like. Image data read by the CCD **131** is subjected to data processing by a reading processing section **116**.

The operation display section **140** includes an LCD **141** of a touch panel type and an operation-section control section **142**. The LCD **141** and the operation-section control section **142** are connected. The operation-section control section **142** and the control CPU **113** are serially communicably connected. With the configuration, control of the operation display section **140** is performed by the control CPU **113**. Note that the operation-section control section **142** can be configured by a CPU, a program for causing the CPU to operate, and the like. In the operation display section **140**, setting in the image forming apparatus and an input of operation control conditions such as an operation command are possible. Further, display of setting content, a machine state, and information and the like are possible. The operation display section **140** is controlled by the control CPU **113**. Printing conditions including a set image interval and set image forming speed can be displayed and notified to the operator and predetermined operation and the like can be performed by the operation display section **140**.

The DRAM control IC **111** is connected to an image memory **120** including a compression memory **121** and a page memory **122**. In the image memory, image data acquired by the scanner section **130** and image data acquired through a LAN **3** are stored. As explained above, the image memory is a storage region for image data. The image memory stores image data of a printing job. Image data concerning a plurality of jobs can be stored in the image memory by the DRAM control IC **111**. That is, image data of a reserved job can be stored in the image memory.

A compression/expansion IC **117** that compresses or expands compressed image data is connected to the DRAM control IC **111**. Further, a writing processing section **123** is connected to the DRAM control IC **111**. The printer section **150** includes a printer control section **151** that controls the entire printer section **150**. The printer control section **151** is connected to the control CPU **113** and receives control. That is, the printer control section **151** performs start/stop of a print operation according to parameters given from the control CPU **113**. The printer section **150** includes the image forming section **100** and the registration roller **20**. Control of the operations of the image forming section **100** and the registration roller **20** is performed by the control CPU **113**.

A DRAM control IC **161** of the image processing section (the print & scanner controller) **160** is connected to the PCI bus **112** connected to the DRAM control IC **111**. In the image processing section (the print & scanner controller) **160**, an image memory **162** is connected to the DRAM control IC **161**. In the image processing section (the print & scanner controller) **160**, a controller control section **163** is connected to the DRAM control IC **161**. A LAN control section **164** and a LAN interface **165** are connected to the DRAM control IC **161**. The LAN interface **165** is connected to the LAN **3**.

A basic operation of the image forming apparatus **1** is explained.

First, a procedure for accumulating image data in the image forming apparatus **1** is explained. When an image of a document is read by the scanner section **130** and image data is generated, in the scanner section **130**, the image of the document is optically read from the document by the CCD **131**. In this case, operation control of the CCD **131** is performed by the scanner control section **132** that receives a command from the control CPU **113**. The image read by the CCD **131** is subjected to data processing by the reading processing section **116**. Image data subjected to the data processing is compressed by a predetermined method in the compression/expansion IC **117** and stored in the compression memory **121** via the DRAM control IC **111**. When printing data is stored in a HDD **119**, compressed printing data is transferred via the DRAM control IC **111** and a controller IC **118** and stored in the HDD **119**.

The printing data stored in the compression memory **121** and the HDD **119** can be managed as a job by the control CPU **113**. The image memory (the DRAM) **120** and the HDD **119** are storing sections that store the image data. In the job management, printing conditions are set and stored in association with the printing data in the image memory (the DRAM) **120** and the HDD **119**.

Note that the printing data and the printing conditions can be stored in different storage media as long as the printing data and the printing conditions are associated. The printing conditions are set by a user through the operation display section **140** or automatically set according to initial setting and an operation situation.

When image data is acquired from the outside, for example, image data transmitted from the terminal (the PC) **2** through the LAN **3** is stored in the image memory **162** by the DRAM control IC **161** via the LAN interface **165** and the LAN control section **164**. In this embodiment, the terminal (the PC) **2** is equivalent to a printing data creating apparatus.

The printing data in the image memory **162** is once stored in the page memory **122** via the DRAM control IC **161**, the PCI bus **112**, and the DRAM control IC **111**. When the printing data is page description data, the printing data can be converted into a raster image by the controller control section **163** through RIP processing. When image data is acquired from the outside, a processing time in the image processing section (the print & scanner controller) **160** is a part of image preparation times.

The printing data stored in the page memory **122** is sequentially sent to the compression/expansion IC **117** via the DRAM control IC **111** and subjected to compression processing and stored in the compression memory **121** via the DRAM control IC **111**. When the printing data is stored in the HDD **119**, the printing data is stored in the HDD **119** via the DRAM control IC **111** and the controller IC **118**. These printing data are managed by the control CPU **113** as explained above. The image memory (the DRAM) **120** and the HDD **119** are storing sections that store the image data. In the job management, printing conditions are set. The image data are stored in association with the printing data in the image memory (the DRAM) **120** and the HDD **119**.

Note that, the printing data and the printing conditions can be stored in different storage media as long as the printing data and the printing conditions are associated. The printing conditions are set by the user through the operation display section **140** or automatically set by the control section according to initial setting and an operation situation.

When the printing data is page description data, the printing data can be converted into a raster image by the

control CPU **113** through RIP processing and stored in the compression memory **121** and the HDD **119**.

When an image output is performed in the image forming apparatus **1**, that is, when the image forming apparatus **1** is used as a copying machine or a printer, if the printing data stored in the compression memory **121** is used, the printing data in the compression memory **121** is sent to the compression/expansion IC **117** via the DRAM control IC **111** and expanded. If the printing data stored in the HDD **119** is used, the printing data in the HDD **119** is sent to the compression/expansion IC **117** via the controller IC **118** and the DRAM control IC **111** and expanded. Expanded image data is sent to the writing processing section **123**. The image data is written in the photosensitive bodies in an LD **152** according to the printing conditions associated with the printing data. Note that, when a layout is performed, the expanded printing data is sent to the page memory **122** to obtain image data laid out in a page. The image data is sent to the writing processing section **123**.

In the printer section **150**, control of the sections is performed by the printer control section **151** that receives a command of the control CPU **113**. In this case, the printing conditions are referred to and control based on contents of the printing conditions is performed according to necessity. In the image forming section **100**, after toner images written in the photosensitive bodies are transferred onto the intermediate transfer belt **16**, the toner images are transferred onto the roll paper supplied by the continuous-paper feeding section **200**. The toner images are fixed by the fixing section **50**. When there are a plurality of reserved jobs, the image output is sequentially performed according to set order. The paper having the image formed thereon is conveyed to the paper-discharge adjusting section **400** by the conveying path **22** through a fixing and conveying roller and wound on the roll in the paper discharge section **500** on the further downstream side.

In the photosensitive bodies, after the toner images are transferred onto the intermediate transfer belt **16**, residual toner is removed by the cleaning sections. In the intermediate transfer belt **16**, similarly, after the toner images are transferred onto the paper, residual toner is removed by the cleaning section.

A block diagram in which the printing conditions and the image preparation until the image data is obtained from the printing data are set by the control section to control the image forming section is shown in FIG. **3**. A result of the image preparation and a result of the printing conditions are used for the control of the image forming section. The settings of the image preparation and the printing conditions are executed in association with each other.

A procedure for performing the setting of the printing conditions and a printing operation on the basis of the printing data is explained on the basis of a flowchart shown in FIG. **4**. The procedure explained below is executed by an image printing control program that operates in the control CPU **113**.

The control CPU **113** starts reception of printing data concerning a job (step s**1**). In this procedure, the printing data is transmitted from the terminal (the PC), which is the printing data creating apparatus.

The control CPU **113** determines whether, in the received printing data, an image interval for arranging images on continuous paper is unset (step s**2**). If the image interval is not unset, that is, the image interval is set (No in step s**2**), the control CPU **113** proceeds to step s**14** and displays image interval information set on an operation panel (the LCD **141**). Consequently, it is possible to learn an image interval corresponding to the printing data before actually performing print processing.

If the image interval is unset (Yes in step s**2**), the control CPU **113** determines whether a page is a target page for determining the image interval (step s**3**).

The determination target can be determined by various methods. For example, all images of the printing data can be set as targets. Images from a first image to a predetermined number of the printing data can be set as targets. Consequently, it is possible to reduce the targets and quickly perform processing. The predetermined number can be set in advance by initial setting or can be set the user through the operation display section. The predetermined number can be set by the control section according to content (a total number of pages, etc.) of a job.

Further, an image having characteristics presumed to take time for image preparation can be set as the determination target.

As criteria for a page presumed to take a long preparation time, determination criteria (a page that takes time for image preparation) in automatic setting of a determination target page can be a page that comes under any one of the following.

A page in which an image itself is complicated

The page depends also on an algorithm of RIP and a processing ability of an apparatus and details of the page cannot be described. However, as a simple example, the page can be considered to depend on a file format. Formats such as a bitmap, a PDF (registered trademark), PostScript (registered trademark), and illustrator (registered trademark) tend to take time.

A page in which a plurality of images are laid out on one page like aggregation/repeat

A page subjected to overlay (combination) processing such as dating or stamping

If a printing data is formed by repetition of the same image or an image obtained by processing a part of the same image, first one image can be set as a target.

Repetition of completely the same image, page numbering or serial numbering of the same image, or the like is assumed. In such a case, the determination target can be relatively easily determined by print setting, pattern matching of an image page, or the like. If this condition is satisfied, only a first page can be set as a determination target page.

In the case of printing in a plurality of prints, printing data of a first print can be set as a target and, concerning a part of the printing data, the determination target can be further narrowed according to the criteria or the like.

If the page is the determination target page (Yes in step s**3**), the control CPU **113** performs image preparation processing concerning printing data of the page (step s**4**). For example, when the printing data stored in the compression memory **121** or the HDD **119** is used, the control CPU **113** sends the printing data to the compression/expansion IC **117** via the DRAM control IC **111** and expands the printing data, performs page numbering or the like, and carries out the image preparation processing. When printing data is acquired from the outside, if the printing data is page description data, the control CPU **113** performs RIP processing in an appropriate period.

During layout, time for allocating the expanded data to a page in the page memory is added to an image preparation processing time.

Subsequently, the control CPU **113** determines whether the determination target page is a last page in the determination target (step s**5**). If the determination target page is not

the last page (No in step s5), the control CPU 113 proceeds to step s3. If the present page is the last page in the determination target (Yes in step s5), the control CPU 113 calculates an image preparation possible time from a result of carrying out the image preparation processing (step s6). A largest time among image preparation possible times is used in the following explanation.

Subsequently, the control CPU 113 calculates an interval that can be prepared when image formation is performed at high speed (step s7). Image forming speed (in a paper passing direction) in performing the image formation at high speed is set in advance (e.g., 200 mm/second). Therefore, in view of a margin of a preparation time, a preparation possible interval (during high speed) is calculated by high-speed time image forming speed×(image preparation possible time+margin). The control CPU 113 sets a reference interval from an image size in the paper passing direction and an image interval of an initial value set in advance and determines whether a sum of the reference interval and a determination interval A is smaller than the image preparation possible time (during high speed) (step s8). The determination interval A is set taking into account an allowable margin, variation, and the like.

If the reference interval +A is smaller than the image preparation possible time (during high speed) (Yes in step s8), image formation is late. Therefore, the control CPU 113 calculates a reference possible interval during low speed of the image forming speed (step s9). Image forming speed (in the paper passing direction) in performing the image formation at low speed is set in advance (e.g., 100 mm/sec). Therefore, a preparation possible interval (during low speed) is calculated by low-speed time image forming speed× (image preparation possible time+margin). Note that, for example, when the image forming speed can be changed in multiple stages, it is also possible to attain both of productivity and suppression of a margin amount by combining a change in the image forming speed and adjustment of an image interval.

After step s10, the control CPU 113 displays image interval information set on the operation panel (step s14).

If reference interval+A is not smaller than the image preparation possible time (during high speed) in step s8 (No in step s8), the control CPU 113 determines whether the reference interval is smaller than the image preparation possible time (step s11). If the reference interval is smaller than the image preparation possible time (Yes in step s11), the control CPU 113 sets the image forming operation to high speed, sets the image interval to 20 mm (step s12), and proceeds to step s14. If the reference interval is not smaller than the image preparation possible time (No in step s11), the control CPU 113 sets the image forming operation to high speed, set the image interval to an initial value (step s13), and proceeds to step s14.

An example of a notification screen 1400 displayed in step s14 is shown in FIG. 5. The notification screen 1400 is displayed on the LCD 141 of the operation display section 140. The notification screen 1400 includes a speed display section 1401 indicating the image forming speed and an interval display section 1402 indicating an image interval. The user can grasp, through the notification screen, setting of printing conditions before printing. The notification screen is displayed on the operation display section of the image forming apparatus. Besides, the notification screen can be notified to the terminal (the PC), a server, or the like independently or in combination with a notification destination.

Note that, in this example, as a result of the calculation of the image interval, the image forming speed is automatically selected. However, printing conditions (operating speed and the image interval) can be displayed on the operation section or the like to urge the user to select the image forming speed. An operation screen 1410 in the example is shown in FIG. 6.

On the operation screen 1410, as setting for performing image formation in time, a first selection button 1411, a second selection button 1412, and a printing stop button 1413 are displayed to be capable of being pressed. In the first selection button 1411, a high-speed operation and an image interval of 100 mm can be set. In the second selection button 1412, a low-speed operation and an image interval of 10 mm is set. In the present setting, the buttons can be reversely displayed or setting content can be displayed in a display field.

The operation screen is displayed on the operation display section of the image forming apparatus. Besides, the operation screen can be notified to the terminal (PC), the server, or the like independently or in combination with a notification destination.

After displaying the image interval information in the image forming apparatus 1 (step s14), the control CPU 113 notifies the terminal PC of the image interval information (step s15).

In the image forming apparatus, the control CPU 113 determines whether it is necessary to carry out printing from the terminal PC (step s16). It is unnecessary to carry out the printing, for example, when the printing is not immediately performed, the image interval is checked, and the printing conditions are set and recorded as a stored job. When it is unnecessary to carry out the printing (No in step s16), the control CPU 113 shifts to step s20 and determines whether the printing data is stored. If it is necessary to carry out the printing (Yes in step s16), the control CPU 113 determines whether a printing start instruction has been received (step s17). The printing start instruction is performed by the image forming apparatus 1. Besides, the printing start instruction can be performed via the terminal (the PC), the server, or the like.

When the printing start instruction has not been received (No in step s17), the control CPU 113 returns to step s16 for determining whether printing is necessary. For example, when execution turn of the stored job comes, the control CPU 113 shifts to a state in which the printing is necessary.

If the printing start instruction has been received (Yes in step s17), the control CPU 113 starts the printing operation (step s18). In the printing operation, the control CPU 113 prints the image interval information in a margin of the last page (step s19). Subsequently, the control CPU 113 determines whether the printing data is stored (step s20). The storage of the printing data can be set in advance. At this stage, an inquiry screen can be displayed in the operation display section or the like to enable the user to select whether the printing data is stored.

If it is determined that the printing data is stored (Yes in step s20), the control CPU 113 stores the printing data in the storing section in association with the printing conditions (step s21) and ends the processing. If it is determined that the printing data is not stored (No in step s20), the control CPU 113 ends the processing.

For example, when the image data is repetition of the same image or an image obtained by processing a part of the same image, repetition of completely the same image, page numbering or serial numbering of the same image, or the like is assumed. In such a case, the determination target can

be relatively easily determined by print setting, pattern matching of an image page, or the like. Therefore, if this condition is satisfied, only a first page can be set as a determination target page.

Image layout performed when the image interval is extended by page aggregation setting under the calculated printing condition is explained. For example, when a printing operation for setting an image size to ½ and four images are aggregated and treated as one page is considered, it is important to align an interval between an image and an image rather than aligning an interval between a page and a page. Therefore, as shown in FIG. **11**, an interval in the paper passing direction between laid-out images is set as 20 mm.

A processing time corresponding to the number of image pages is required for the RIP processing including expansion and reduction of the images. However, since there is almost no difference concerning a shift of an image position, time necessary for shift processing is not taken into account.

EXAMPLES

Examples of the present invention are explained.

Note that all the examples explained below are based on conditions explained below. Configurations and operation conditions can be set in the image forming apparatus in advance or can be set by the operator using the operation panel.

An image of A4 size=paper passing direction 210 [mm] is printed on continuous paper.

The image forming apparatus is capable of operating at two kinds of image forming speed, i.e., high speed 200 [mm/s] and low speed 100 [mm/s].

A value of the image forming speed can be switched according to, for example, a level of a fixing temperature.

As an initial value of an image interval, 10 [mm] is used. A reference interval of images is an image size+10 [mm].

Note that the image interval can be printed in, for example, a margin of a first page to be printed.

Unless image formation preparation for the previous page is not completed, image preparation for the next page cannot be started.

Only when the image preparation is completed, image formation on the relevant page can be started.

Taking into account a processing delay during an actual printing operation, a margin equal to or larger than 50 ms is secured for an image interval with respect to image preparation times.

Image preparation times with respect to image pages Pn are represented as Tn.

(n (integer)=01, 02, . . .)

Image data are represented by Gn. When an aggregation/repeat function or the like is not used, it can be regarded as Pn=Gn.

In execution of a printing operation, a blank (a break) occurs in a paper because of pre-processing and post-processing of an electrophotographic process.

Example 1

An example 1 is explained with reference to FIG. **7**.

[Setting]

Determination last page: last page (=P100)

Determination target page: all

Setting of printing conditions is performed according to a processing procedure explained below. Note that the processing procedure is performed according to the flowchart of FIG. **4**.

(1) Start reception of printing data from a client PC.

(2) Do not start a printing operation while an image interval is unset.

(3) Perform image preparation from P01 to the determination last page (P100). When image data reception is late, wait for image data any time.

In this example, it is assumed that a maximum of image preparation times is 1000 [ms].

(4) As explained below, since a reference interval is larger than a preparation possible interval, keep operation speed at high speed and keep the image interval at initial setting 10 [mm]. Set a determination interval A to 20 mm taking into account variation.

Reference interval: 220 [mm] (=210 [mm]+10 [mm])

Preparation possible interval (high speed): 210 [mm] (=200 [mm/s]×(1000+50)/1000 [s])<(220 [mm]+20 [mm])

(5) In a high-speed operation, update a printing condition to an image interval 10 [mm] shown in FIG. **7**.

(6) Display printing conditions (the speed and the image interval) on the operation section and notify the client PC of the printing conditions.

(7) Store the printing data in the HDD of the image forming apparatus.

(8) After the processing of (7), when a printing start instruction for the data stored in the HDD is received, perform a printing operation according to the image interval.

(9) After finishing image formation of the last page (P100), as shown in FIG. **7**, an image interval (Interval=10 mm) is printed in a margin portion.

Example 2

An example 2 is explained with reference to FIG. **8**.

In this example, printing conditions are calculated from information up to a predetermined page and a printing operation is performed.

[Setting]

Determination last page: set to 20 pages (=P20)

Determination target page: all

(1) Start reception of printing data from the client PC.

(2) Do not start a printing operation while an image interval is undecided.

(3) Perform image preparation from P01 to the determination last page (P20). When image data reception is late, wait for image data any time.

In this example, it is assumed that a maximum of image preparation times is 1100 [ms].

(4) As explained below, since a difference between a preparation possible interval and a reference interval does not exceed 20 [mm], change operation speed to high speed and change the image interval to 20 [mm].

Reference interval: 220 [mm] (=210 [mm]+10 [mm])

Preparation possible interval (high speed): 230 [mm] (=200 [mm/s]×(1100+50)/1000 [s])<(220 [mm]+20 [mm])

○

(5) In a high-speed operation, as shown in FIG. **8**, update a printing condition to an image interval 20 [mm].

(6) Display printing conditions (the speed and the image interval) on the operation section and notify the client PC of the printing conditions.

(7) When a printing start is instructed, start a printing operation from P01. Start image preparation processing from P01 in parallel to the printing operation.

(8) After finishing the image formation of the last page (P100), as shown in FIG. **8**, an image interval (Interval=20 mm) is printed in a margin portion.

(9) If storage of printing data is instructed, store the printing data in the HDD of the image forming apparatus.

Example 3

An example 3 is explained with reference to FIG. **9**.

In this example, printing conditions are calculated from information of a first print and a printing operation is performed.

[Setting]

Determination last page: set to one print (=P10)

Determination target page: automatically set (only a page presumed to take a long preparation time)

(1) Start reception of printing data from the client PC.

(2) Do not start a printing operation while an image interval is undecided.

(3) Perform image preparation from P01 to the determination last page (P10). When image data reception is late, wait for image data any time.

However, since the determination target page is automatically set, the image preparation is carried out for only the page presumed to take a long preparation time.

In this example, it is assumed that a maximum of image preparation times is 1500 [ms].

(4) As explained below, since a difference between a preparation possible interval and a reference interval exceeds 20 [mm], change operation speed to low speed and calculate an image interval.

Reference interval: 220 [mm] (=210 [mm]+10 [mm])

Preparation possible interval (high speed): 310 [mm] (=200 [mm/s]×(1500+50)/1000 [s])>(220 [mm]+20 [mm]) ×

Preparation possible interval (low speed): 155 [mm] (=100 [mm/s]×(1500+50)/1000 [s]) ○

(5) In a low-speed operation, as shown in FIG. **9**, update a printing condition to an image interval 10 [mm].

(6) Display printing conditions (the speed and the image interval) on the operation section and notify the client PC of the printing conditions.

(7) When a printing start is instructed, start a printing operation from P01. Start image preparation processing from P01 in parallel to the printing operation.

(8) After finishing the image formation of the last page (P100), as shown in FIG. **9**, an image interval (Interval=10 mm) is printed in a margin portion.

(9) If storage of printing data is instructed, store the printing data in the HDD of the image forming apparatus.

Note that, when a printing operation for setting an image size to ½ and four images are aggregated and treated as one page is considered, it is important to align an interval between an image and an image rather than aligning an interval between a page and a page. Image arrangement in the case in which an image interval is determined as 10 [mm] is treated as printing data shown in FIG. **10**. Image arrangement in the case in which an image interval is determined as 20 [mm] is treated as printing data shown in FIG. **11**.

The determination process for an image interval can be performed along the above examples.

A processing time corresponding to the number of image pages is required for the RIP processing including expansion and reduction of the images. However, since there is almost no difference concerning a shift of an image position, time necessary for shift processing need not to be taken into account.

That is, according to the embodiment, it is possible to execute an image output in time for printing timing, it is possible to reduce a blank region between an image and an image on a paper as much as possible, and it is possible to fix an image interval and print the images on continuous paper. That is, in the present invention, it is possible to attain both of minimization of the image interval and fluctuation suppression.

The present invention is explained above on the basis of the embodiment and the examples. However, the present invention is not limited to the contents described in the embodiment and the examples and, naturally, can be changed as appropriate without departing from the spirit of the present invention.

What is claimed is:

1. An image forming apparatus comprising:

an image forming section that performs processing for forming an image on continuous paper based on image data; and

a hardware processor configured to perform image preparation to convert printing data into the image data from which an image can be formed and controls the image forming section to execute printing of a plurality of images spaced apart at equal intervals on the continuous paper, wherein

the hardware processor is further configured to perform, before the image formation processing, printing condition setting according to image sizes in a paper passing direction, image forming speeds, and image preparation times related to the images, and

the printing condition setting performed by the hardware processor includes setting the equal intervals between the images.

2. The image forming apparatus according to claim **1**, wherein, in the printing condition setting, the hardware processor is configured to perform setting of a new image forming speed and the hardware processor is configured to perform setting of the equal intervals between images using the new image forming speed.

3. The image forming apparatus according to claim **1**, wherein, in the printing condition setting, when an image formation interval at an image forming speed set in advance is greater than a predetermined image interval, the hardware processor sets the equal intervals between the images within the predetermined image interval and sets the image forming speed lower than the image forming speed set in advance.

4. The image forming apparatus according to claim **1**, wherein, in the printing condition setting, the hardware processor calculates image preparation times with respect to all images of the printing data and calculates the equal intervals between the images based on a maximum of the image preparation times.

5. The image forming apparatus according to claim **1**, wherein, in the printing condition setting, the hardware processor calculates image preparation times with respect to images from a first image to a predetermined number of the printing data and calculates the equal intervals between the images based on a maximum of the image preparation times.

6. The image forming apparatus according to claim **1**, wherein, in the printing condition setting, the hardware processor calculates image preparation times of image data having a characteristic presumed to take time for image preparation and calculates the equal intervals between the images based on a maximum of the image preparation times.

7. The image forming apparatus according to claim **1**, wherein, in the printing condition setting, in a case of printing data configured by repetition of a same image or an image obtained by processing a part of the same image, the

hardware processor calculates the equal intervals between the images based on an image preparation time of first one image.

8. The image forming apparatus according to claim **1**, wherein, in the printing condition setting, in a case of printing data configured by a plurality of prints, the hardware processor calculates the equal intervals between the images based on printing data of a first print.

9. The image forming apparatus according to claim **1**, wherein, after receiving an execution instruction for a printing operation, the hardware processor calculates the equal intervals between the images in the printing condition setting.

10. The image forming apparatus according to claim **1**, wherein the hardware processor stores, in association with the printing data, printing conditions set in the printing condition setting and does not perform recalculation of the printing conditions when same printing data is reprinted.

11. The image forming apparatus according to claim **1**, wherein, when a notification request for printing conditions is sent from a printing data creating apparatus outside the image forming apparatus to the image forming apparatus, after receiving the printing data, the hardware processor is configured to perform the printing condition setting and notifies the printing data creating apparatus of the obtained printing conditions.

12. The image forming apparatus according to claim **1**, wherein, when layout processing for the image data is set in a job, the hardware processor is configured to perform image formation on the basis of image data for which a layout position is determined based on the equal intervals between the images set by the hardware processor.

13. The image forming apparatus according to claim **1**, wherein the hardware processor notifies a user of the set printing conditions.

14. The image forming apparatus according to claim **13**, wherein the hardware processor notifies the user of the printing conditions after printing.

15. The image forming apparatus according to claim **13**, wherein the hardware processor notifies the user of the printing conditions set before a printing start to enable the user to select the printing conditions or instruct to stop printing.

16. The image forming apparatus according to claim **1**, wherein the hardware processor controls the image forming section to print, in a margin portion of continuous paper, setting information set under the printing conditions.

17. The image forming apparatus according to claim **1**, wherein, in the printing condition setting, the hardware processor calculates the image preparation time while causing control affecting a conversion processing time of the image data to operate in parallel to the printing operation.

18. An image printing method comprising:

an image preparing step for performing image preparation to convert printing data into image data from which an image can be formed;

a printing condition setting step including setting, before an image formation processing, an interval between images according to image sizes in a paper passing direction, image forming speeds, and image preparation times related to the images; and

a printing step for printing, based on the image data, a plurality of images spaced apart at equal intervals on continuous paper according to the interval which has been set in the printing condition setting step.

19. The image printing method according to claim **18**, further comprising a step of storing, in association with the printing data, printing conditions set in the printing condition setting step, wherein

in the printing condition setting step, recalculation of the printing conditions is not performed when same printing data is reprinted.

20. The image printing method according to claim **18**, further comprising:

a step of receiving a notification request for printing conditions from a printing data creating apparatus present on an outside of an apparatus that performs image printing;

a step of receiving the printing data from the printing data creating apparatus; and

a step of notifying the printing data creating apparatus of the printing conditions obtained in the printing condition setting step.

21. The image printing method according to claim **18**, further comprising a step of notifying a user of printing conditions set during the printing condition setting step.

22. The image printing method according to claim **21**, further comprising:

a step of notifying the user of the printing conditions set before a printing start; and

a step of receiving selection of the printing conditions or a printing stop by the user.

23. The image printing method according to claim **18**, wherein, in the printing step, setting information set in the printing condition setting step is printed in a margin portion of the continuous paper.

24. A non-transitory computer-readable recording medium having stored therein an image printing control program executed by a hardware processor that controls an image forming apparatus that performs processing for forming an image on continuous paper on the basis of image data,

the image formation control program executed by the hardware processor comprises:

an image preparing step for performing image preparation to convert printing data into image data from which an image can be formed;

a printing condition setting step including setting, before an image formation processing, an interval between images according to image sizes in paper passing directions, image forming speeds, and image preparation times related to the images; and

a printing step for printing, based on the image data, a plurality of images at equal intervals on continuous paper according to the interval which has been set in the printing condition setting step.

25. The computer-readable recording medium having stored therein the image printing control program according to claim **24**, wherein the image printing control program further executes a step of, when a notification request for printing conditions is received from a printing data creating apparatus present on an outside of an image printing apparatus, receiving the printing data from the printing data creating apparatus and notifying the printing data creating apparatus of the printing conditions obtained in the printing condition setting step.

26. The computer-readable recording medium having stored therein the image printing control program according to claim **24**, wherein the image printing control program further executes:

a step of notifying a user of the printing conditions set before a printing start; and

a step of receiving selection of the printing conditions or a printing stop by the user.

27. The image forming apparatus according to claim **1**, wherein

the hardware processor determines a reference interval based on the image sizes in the paper passing direction;

the hardware processor determines a preparation possible interval based on the image forming speeds and the image preparation times;

the hardware processor compares the reference interval and the preparation possible interval to achieve a comparison result; and

the hardware processor sets the equal intervals between the images based on the comparison result.

28. The image forming apparatus according to claim **27**, wherein

the hardware processor sets a new image forming speed based on the comparison result; and

the hardware processor sets the equal intervals between the images using the new image forming speed.

29. The image forming apparatus according to claim **28**, wherein

when the hardware processor determines the reference interval is smaller than the preparation possible interval, the hardware processor sets the equal intervals between the images at a first interval value and sets the new image forming speed at a first speed; and

when the hardware processor determines the reference interval is equal to or more than the preparation possible interval, the hardware processor sets the equal intervals between the images at a second interval value that is smaller than the first interval value and sets the new image forming speed at the first speed.

30. The image forming apparatus according to claim **29**, wherein

a cumulative interval is the reference interval added to a predetermined determination interval; and

when the hardware processor determines the cumulative interval is smaller than the preparation possible interval, the hardware processor sets the new image forming speed at a second speed which is smaller than the first speed.

31. The computer-readable recording medium according to claim **24**, wherein the image printing control program further comprises

a determination step of determining a reference interval based on the image sizes in the paper passing direction and determining a preparation possible interval based on the image forming speeds and the image preparation times; and

a comparing step of comparing the reference interval and the preparation possible interval to achieve a comparison result, wherein

the printing condition setting step sets the interval between the images based on the comparison result achieved in the comparing step.

32. The computer-readable recording medium according to claim **31**, wherein

the image printing control program further comprises a forming speed setting step of setting a new image forming speed based on the comparison result, and

the printing condition setting step sets the interval between the images using the new image forming speed.

33. The computer-readable medium according to claim **32**, wherein

when the reference interval is determined to be smaller than the preparation possible interval in the determination step, the printing condition setting step sets the interval between the images at a first interval value and sets the new image forming speed at a first speed, and

when the reference interval is determined to be equal to or more than the preparation possible interval in the determination step, the printing condition setting step sets the equal intervals between the images at a second interval value that is smaller than the first interval value and sets the new image forming speed at the first speed.

34. The computer-readable medium according to claim **33**, wherein

a cumulative interval is the reference interval added to a predetermined determination interval, and

when the cumulative interval is determined to be smaller than the preparation possible interval in the determination step, the printing condition setting step sets the new image forming speed at a second speed which is smaller than the first speed.

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